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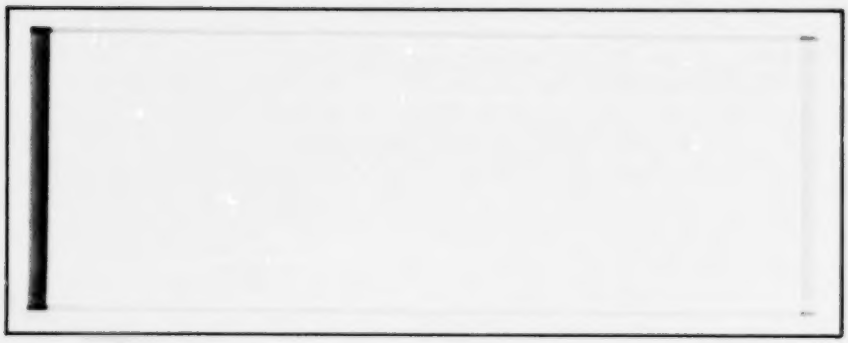

WORKING PAPER

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THE NATIONAL TRIPARTITE STABILIZATION PROGRAM FOR RED MEATS: HOG MODEL

(Working Paper 5/88)

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This report is the result of the efforts undertaken by the Cost Model Subcommittee of the National Tripartite Hog Stabilization Committee to review the model used for hog stabilization calculations. The revised hog model was accepted by the Hog Committee in March 1987.

Appreciation to the various people who reviewed the initial draft report is gratefully acknowledged.

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I. INTRODUCTION

The 1985 amendment of the Agricultural Stabilization Act provided for the development of national plans to support the red meats industry. The National Tripartite Stabilization Plan (NTSP) is a culmination of several years of negotiations among the federal and provincial governments and industry representatives. The NTSP provides for separate programs for the designated commodities. The NTSP for hogs was signed in 1986 and it is designed to reduce loss to producers from market risks by stabilizing prices. The Plan provides the same level of support to all participating producers. The cost of the Plan is shared equally among the federal and provincial governments and the participating producers. Participating provinces must phase out any existing stabilization plans by 1990.

II. OBJECTIVE

The purpose of this report is to provide a description of the Hog Cost Model and document the underlying assumptions and procedures used to generate a national weighted average cost of production and market price from which the support level for the National Tripartite Program for hogs is calculated.

This report is arranged in the following manner. Section III details the assumptions used in the model, section IV describes the cost of production model followed by a description on how the market price is determined in section V. The last section indicates how stabilization payments are calculated. An appendix is included which describes the various data used in the model and the sources of these data.

III. THE NTSP for HOGS

The national tripartite stabilization program for hog producers is a quarterly program based on a farrow-to-finish enterprise. The support level from which payments are calculated is based on the "guaranteed margin" approach. The support price for any quarter is equal to the national average cash costs for that quarter plus a percentage (90%-95%) of the difference or "margin" between the national average price and national average cash cost for the same quarter of the preceding five years. In any quarter that the market price falls below the support price a payment equal to the difference is triggered .

The national cash cost of production is calculated from budgets based on input prices and quantities required to raise hogs in British Columbia, Alberta, Saskatchewan, Manitoba,

Ontario, Quebec and the Atlantic Region. The national weighted average market price is the index 100 price of hogs in representative markets weighted by the number of both federally and provincially inspected hogs with an index of 80 or above. The model has been designed to reflect current industry structure and production practices in the hog industry. All calculations are made on a per hundred kilogram (CKG) liveweight basis.

IV. MODEL DESCRIPTION

The model generates seven separate cost budgets, one each for British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec and the Atlantic region. These budgets calculate cash cost of production on a per head and per 100 kilogram sold (liveweight basis). A national weighted average cash cost on a per head and per 100 kilogram sold (liveweight basis) is then calculated by weighting the provincial/regional cash cost by the provincial/ regional slaughter number for both federally and provincially inspected hogs with an index of 80 or above.

The model is based on an efficient, commercial and family level operation. The following underlying assumptions are used in the calculations of cash costs of production and the market price.

The following description applies to all provincial budgets unless indicated otherwise.

1. Size of Enterprise

- Farrow to finish
- 130 sows and 8 boars; Ratio 16 1/4 : 1
- 2.1 litters per sow per year
- 10.0 piglets born per farrowing
- 8.5 piglets weaned per farrowing
  (piglet rate of death loss = 15%)
- 2321 piglets weaned per year
- 2251 hogs sold per year
  (includes both market hogs and culled sows)
- 3% death loss at the grower/finisher stage.

2. Breeding Stock

Sows
- culled after an average of 5 litters
- replacement value of the cull sow equals the cost of home grown replacement gilts
- a 5% sow death loss is replaced with the value of quality purchased gilts.

Boars
- culled after 2 years in the enterprise
- all replacements purchased

3. Market Hogs

Weaners	- 0-20 kg live weight
Growers	- 20-55 kg live weight; 35 kg gain
Finishers	- 55-100 kg live weight; 45 kg gain
Slaughter Hogs	- 78.5 kg (173 lb) dressed weight (dressed weight = 78.5% of live weight)

4. Buildings and Equipment

- Swine housing and equipment costs for a 130 sow farrow-to-finish operation are based on Canada Plan Service (CPS) plans # M-3236, M-3303, and M-3428 and 1986 spring values.

- The capital cost per sow is as follows:

Dry sow breeding	625.00
Farrowing/weaning	1,000.00
Finishing	983.00
Miscellaneous	1,255.00
Total	3,863.00

The capital cost of $3,863 is converted to a per marketable hog basis and this works out to $223 per marketable hog. The replacement costs are then separated into the building and equipment portions which works out to be $97.55 and $125.45.

5. Feed Cost Components

The cash costs of producing hogs are categorized into three groups, feed, interest and other costs. Feed costs are further broken down into starter, grower and finisher. The 'other' cost component is comprised of repairs and maintenance, utilities, property tax, veterinary and health expense, insurance, animal replacement, hired labour and marketing. In order to calculate stabilization levels promptly, feed and interest costs are calculated from actual current data. The other costs are updated using the appropriate farm input price indices. The base period of these other costs is the first quarter of the previous year. All costs for any Quarter , with the exception of feed costs for the breeding stock and weaners, are calculated based on the prices of the previous quarter. Feed costs for the breeding stock and starter are calculated from prices of feed which are lagged two quarters.

The major item of the cash cost of producing a hog is feed. In the model it is assumed that all feed is mixed on the farm and the ingredients are purchased either from another enterprise on the farm or externally. The feed rations developed for the model are in line with National Research Council recommendations in terms of crude protein level (Table 1).

Table 1. Protein Requirements

Ration	Protein Level (%)
Sows & Boars	14
Starter	18
Grower	16
Finisher	14

5.1 Ration Composition

The grain composition of the hog ration is largely determined by the availability of feed grains and the desired protein level in the ration. Table 2 details the different components of the feed rations for the various regions.

Table 2. Regional Feed Ration

	Starter	Grower	Finisher
Protein Requirement	18%	16%	14%
Ration for Quebec			
Corn	60	57	43
Barley	10	20	42
38% Supplement*		23	15
40% Supplement*	30		
Ration for Ontario			
Corn	70	77	83
40% Supplement*	30	23	17
Ration for British Columbia, Alberta Saskatchewan, Manitoba, & the Maritimes			
Barley	29	48	70
Wheat	50	37	20
38% Supplement*		15	10
40% Supplement*	21		

* The supplements include protein concentrate; limestone, calcium, phosphate cobalt iodized salt (macro-premix); vitamin-mineral premix (micro-premix) and sources of additional energy.

5.2 Quantity Fed

The amount of feed consumed is calculated on a marketable hog basis based on the different categories of hogs fed in the farrow to finish operation. Feed requirements for each category of hogs are:

Breeding Stock - fed the 14% Finisher ration.

- Sows consume 5.5 kg/day for 88 days (2.1 litters) and 2.3 kg/day for 277 days for a total feed consumption of 1,121 kg per year or 62.81 kg per pig weaned, 64.75 kg per hog marketed.[1]

- Boars consume 1,000 kg of feed per year or 3.45 kg per pig weaned, 3.55 kg per hog marketed.

Weaners - consume 30 kg of Starter ration (18%), 30.93 kg per hog marketed.

Table 3 summaries the amount of feed consumed by sows, boars and weaners.

[1] Kg of feed per hog marketed is equal to Kg of feed per pig weaned divided by 0.97 to take into account a 3% loss of growers.

The table below summarizes feed consumed by hog categories and by region.

Table 3. Starter, Sow and Boar Feed Ration
(kilograms of grains and supplements per marketable hog)

Quebec

Ration	Total	Corn	Barley	Supplement 40%	Supplement 38%
Starter (Weaners)	30.93	18.56	3.09	9.28	-
Sow	64.75	27.84	27.20	-	9.71
Boar	3.55	1.53	1.49	-	0.53
Total	99.23	47.93	31.78	9.28	10.24

Ontario

Ration	Total	Corn	Supplement 40%
Starter (weaners)	30.93	21.65	9.28
Sow	64.75	53.74	11.01
Boar	3.55	2.95	0.60
Total	99.23	78.34	20.89

Maritimes, Manitoba, Saskatchewan, Alberta & British Columbia

Ration	Total	Barley	Wheat	Supplement 40%	Supplement 38%
Starter (Weaners)	30.93	8.97	15.46	6.50	-
Sow	64.75	45.32	12.95	-	6.48
Boar	3.55	2.48	0.71	-	0.36
Total	99.23	56.77	29.12	6.50	6.84

Growers/Finishers Feed

- Growers and Finishers consume a total quantity of feed equivalent to the live weight gained (80 kg) times the adjusted feed conversion ratio (AFCR) (i.e. the live weight gained [100 kg (finished weight) less 20 kg (weaner weight)] times the adjusted feed conversion ratio). The adjusted feed conversion ratio is the National Record of Performance (R.O.P) boar test feed conversion rates averaged over the most recent three years multiplied by an adjustment factor. These factors are 1.45 and 1.6 for corn fed and barley fed hogs respectively.[1] The difference in the adjustment factors is to account for the lower energy level of barley vis-a-vis corn. For the province of Quebec the weighted average

[1] The adjustment factors have been determined on the expert advice of industry members of the Cost Model Sub-committee.

of the two factors based on the proportion of barley and corn in the ration is used in the calculations. When wheat is used in the ration the barley adjustment factor is applied. The ROP boar test feed conversion rate is increased by the adjustment factor because the feed conversion rate of a commercial herd is poorer due to lower feed efficiency than that of a ROP boar.

The amounts of grains and supplements in the grower and finisher rations must be calculated after the total ration is determined. The grower and finisher rations are calculated as follows:

Growers Component - A grower ration is used from 20 to 55 kg for a liveweight gain of 35 kg. At this stage, hogs have a superior conversion rate that is 84% of the overall adjusted feed conversion ratio. Grower feed per hog is determined by the following formula:

Grower Feed = 35 kg of grain * 0.84 * Adjusted Feed Conversion Ratio. To account for a 3% death loss in the grower/finisher stage, the amount of grower feed required to produce a market hog is divided by 0.97.

Finishers Component - The quantity of Finisher Feed is the difference between total Grower/Finisher Feed required and the amount fed to growers. This is calculated by the liveweight gain (80 kg) * AFCR less Grower Feed (prior to accounting for death loss). The death loss is assumed to occur before the Finisher stage.

5.4 Feed Prices

For Alberta, Saskatchewan and Manitoba, the weighted average price received by farmers for non-board grains (barley and wheat) for Western Canada published by the Canadian Grain commission from Western Grain Stabilization Administration records are used.

In British Columbia the wholesale price of feed grains (barley and wheat) in Vancouver (track) as published in "Grain Facts" by the Livestock Feed Board are used because most of the feed grain is imported into the province.

In Ontario prices received by farmers for corn are used in the model. The price series are published by Ontario Ministry of Agriculture and Food.

In the province of Quebec the wholesale prices quoted at Quebec City and Montreal are averaged for corn and barley. The price series are published in "Grain Facts" by the Livestock Feed Board. The corn price is either the U.S. C.I.F. or the Canadian Track price, whichever is lower in each week.

In the Atlantic Region most grain is imported into the region. The wholesale prices of barley and wheat in Moncton (track) as published in "Grain Facts" are used.

The price series for the 38% Supplement are the average wholesale prices of 35-40% Hog Supplement for each region. The 40% Supplement is valued at 1.044 times the 38% Supplement price. The wholesale prices come from the Livestock Feed Board of Canada's weekly survey of Wholesale Mixed Feed Prices. Prices are quoted for the Atlantic region and all provinces except B.C., where the Alberta price is used.

6. Other Cost Component

Although the same cost model is used for all the regions costs are different due to the different indices used between Eastern and Western Canada and the regional price differentials. Cost per marketable hog for each component is described below.

6.1 Repairs and Maintenance

Repairs and maintenance of the buildings and equipment, are taken as 2% of the average replacement cost of the buildings and 5% of the average replacement cost of the equipment. The average replacement cost is calculated by summing the ending and beginning value of building and equipment and dividing this total by 2[1]. This is an attempt to reflect the average amount of assets used in the farming operations during the year. A base value is calculated on a per marketable hog basis. The calculations are defined in the following equations.

Base Value :

Building	$ 97.55/2	* 0.02	= 0.98
Equipment	$125.45/2	* 0.05	= 3.14
			$4.12

[1]The ending value of the building and equipment is assumed to be zero.

6.2 Utilities

The cost of utilities include heat, light ventilation, telephone etc. A base value of $2.59[1] is used for all regions; this is indexed by the Electricity Index (East or West).

6.3 Property Tax

Property taxes are calculated at 0.75% of the average replacement value of buildings and indexed by the Property Tax Index (East or West). The base values are:

Western Base Value = $74.00/2 * 0.0075 = 0.28

Eastern Base Value = $69.71/2 * 0.0075 = 0.26

6.4 Insurance

Buildings and Equipment insurance is $0.80 per $100 on average replacement costs and are indexed by the Building Replacement Index (West or East). The base values are:

West = $169.19/2 * 0.008 = $0.68

East = $159.36/2 * 0.008 = $0.64

[1] Estimated from prices published by the Department of Energy, Mines and Resources in the Energy Handbook.

Breeding stock are insured at $0.45 and inventory at $0.60 per $100 of their replacement value. Boars, sows and inventory are replaced at values set at 5 times, 3 times and the average market price of slaughter hogs respectively. The base values are:

Base value = (0.0045 [(8 boars * 5 * Index 100 price) + (130 sows * 3 * Index 100 price)] + 0.006 * (2251/2.1 marketable hogs * Index 100 price)}/2251 * (number of hogs sold)

This simplifies to:

= 0.004 * Index 100 price for the different region and time period under consideration.

6.5 Breeding Herd Replacement

Boars - Four boars are replaced each year. Replacement boars are bought at a cost of 5 times the average market price of slaughter hogs. The market returns of cull boars are one-half the average Index 100 price per 100 lbs of liveweight. Cull boars weigh 450 lbs and 4 are culled each year.

Replacement Cost = [(4 * 5 * Index 100 price) - (4 * 4.5 * 0.5 Index 100 price)] / 2251

which simplifies to:

= 0.0049 * Index 100 price.

Gilts - are purchased to replace only sows lost through death. The cost of these gilts is 3 times the Index 100 price of slaughter hogs. Death loss for sows is 5%.

Replacement Cost = [0.05 * 130 sows * 3 * Index 100 price]/2251

simplifying to:

= 0.0087 * Index 100 price.

Total Replacement Cost = (0.0049 + 0.0087) * Index 100 price

= 0.0136 * Index 100 price per marketable hog

6.6 Veterinary and Health Expenses

The cost of veterinary and health covers routine items, including supplies for tail docking, castration, iron injections, vitamins, bran for the sow, etc. The base value for all regions is $2.00; this is indexed by the Artificial Insemination Index (East or West).

6.7 Labour

Hired labour of 0.45 hours/marketable hog is priced at the quarterly Farm Labour Wage Rate (without board) in each province/region. Operator labour is not included as a cash cost.

6.8 Marketing

Costs of marketing include insurance and assembly fees, but excludes levies for the purchase of processing plants. Marketing costs are estimated at 1% of the Index 100 prices prevailing in Alberta, Saskatchewan, Manitoba, and Toronto. For British Columbia the prevailing Alberta prices are used while the prevailing Toronto prices are used for Quebec and the Maritimes.

7. Interest Cost

Interest charges are calculated on the cash costs specified above. They are determined from one half of the total cash costs for 6 months at the prime business interest rate plus 1.5% in all provinces/region.

V. MARKET PRICES

The national average market price of hogs is a weighted average of the Index 100 price of hogs reported forn Ontario, Manitoba, Saskatchewan, and Alberta[1]. These prices are weighted by the number of hogs with an index of 80 and above slaughtered in both federally and provincially inspected establishments in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec and the Atlantic Region. The Ontario price is weighted by the slaughterings in Ontario, Quebec and the Atlantic Region while the Alberta price is weighted by the slaughterings in British Columbia and Alberta. Data on prices and number of animals slaughtered are published by Agriculture Canada in the Canada Livestock and Meat Trade Report.

VI. STABILIZATION PAYMENT

The NTSP for hogs uses a guaranteed margin approach in calculating the paymerts. The margin is the difference between the previous five years average price and costs for a particular quarter multiplied by the support factor. The support factor for the program is 95% up to and including 1986, for 1987 it is 94% and for the current year (1988) it is 93%[2]. The support

[1] These prices are establshd by the respective marketing boards in Alberta, Saskatchewan, Manitoba and Ontario.
[2] Determined in Schedule E of the NTSP agreement for hogs.

price/level in a quarter is the sum of the guaranteed margin and the cash costs for that quarter. This can be represented by the following equation:

Support level = National cash cost + support factor X
[5-year-average price - 5-year-average cost]

In any quarter that the national weighted average market price falls below the support price, a payment is generated. This payment is made on hogs grading index 80 or better that have been owned by the producer for at least 60 days. The distribution of the payouts over the 1981 Q1 to 1988 Q1 period is detailed in table 4. A graphic representation of the various components of the hog program is given in Figure 1. The total payout amount is calculated by multiplying the total number of hog marketed in Canada (assuming that every hog is registered under the program) by the amount of payout per head.

Table 4. Support Payments Calculations ($/100 kilograms)

YEAR/QTR	NATIONAL PRICE	NATIONAL COST	FIVE-YEAR-AVERAGE PRICE	FIVE-YEAR-AVERAGE COST	SUPPORT LEVEL	PAYOUT ($) PER CKG	PAYOUT ($) PER HEAD
1 Q 1981	141.98	119.74	139.57	82.57	173.89	31.91	24.84
2 Q 1981	144.77	124.88	134.74	83.72	173.34	28.57	21.92
3 Q 1981	173.77	124.80	142.58	87.69	176.94	3.16	2.42
4 Q 1981	153.94	121.16	140.24	89.80	169.09	15.14	11.74
1 Q 1982	152.76	111.00	137.77	90.49	155.92	3.15	2.47
2 Q 1982	190.58	108.80	134.52	92.79	148.45		
3 Q 1982	208.85	111.15	149.05	96.59	160.98		
4 Q 1982	183.52	107.50	147.88	97.32	155.54		
1 Q 1983	181.61	100.41	144.38	96.95	145.46		
2 Q 1983	156.12	102.45	146.65	98.76	147.94		
3 Q 1983	151.64	108.79	162.59	101.93	166.42	14.78	11.47
4 Q 1983	137.12	116.87	157.16	103.46	167.89	30.77	23.94
1 Q 1984	146.39	121.85	150.88	102.61	167.71	21.32	16.64
2 Q 1984	160.06	122.95	148.31	104.30	164.76	4.70	3.67
3 Q 1984	172.96	126.44	162.84	107.46	179.05	6.09	4.75
4 Q 1984	156.67	125.49	151.43	110.82	164.07	7.40	5.80
1 Q 1985	156.43	117.73	147.77	110.65	152.99		
2 Q 1985	139.05	116.20	151.68	111.82	154.06	15.01	11.75
3 Q 1985	148.38	115.33	170.40	114.39	168.54	20.17	15.72
4 Q 1985	155.75	111.27	157.62	116.12	150.70		
1 Q 1986	152.51	105.49	155.83	114.14	145.10		
2 Q 1986	159.53	106.52	158.12	115.06	147.42		
3 Q 1986	212.88	105.38	171.12	117.30	156.50		
4 Q 1986	193.18	102.01	157.40	116.46	140.91		
1 Q 1987	159.65	$97.17	157.94	111.29	141.01		
2 Q 1987	185.97	$95.40	161.07	111.39	142.10		
3 Q 1987	199.73	$96.58	178.94	113.42	158.17		
4 Q 1987	152.78	$95.77	165.25	112.63	145.23		
1 Q 1988	139.11	$95.81	159.32	108.53	143.05	3.93	3.14

For example the values for 1988 Q1 can be derived as follows:

5-year-average price = sum[price(83q1+84q1+85q1+86q1+87q1)]/5

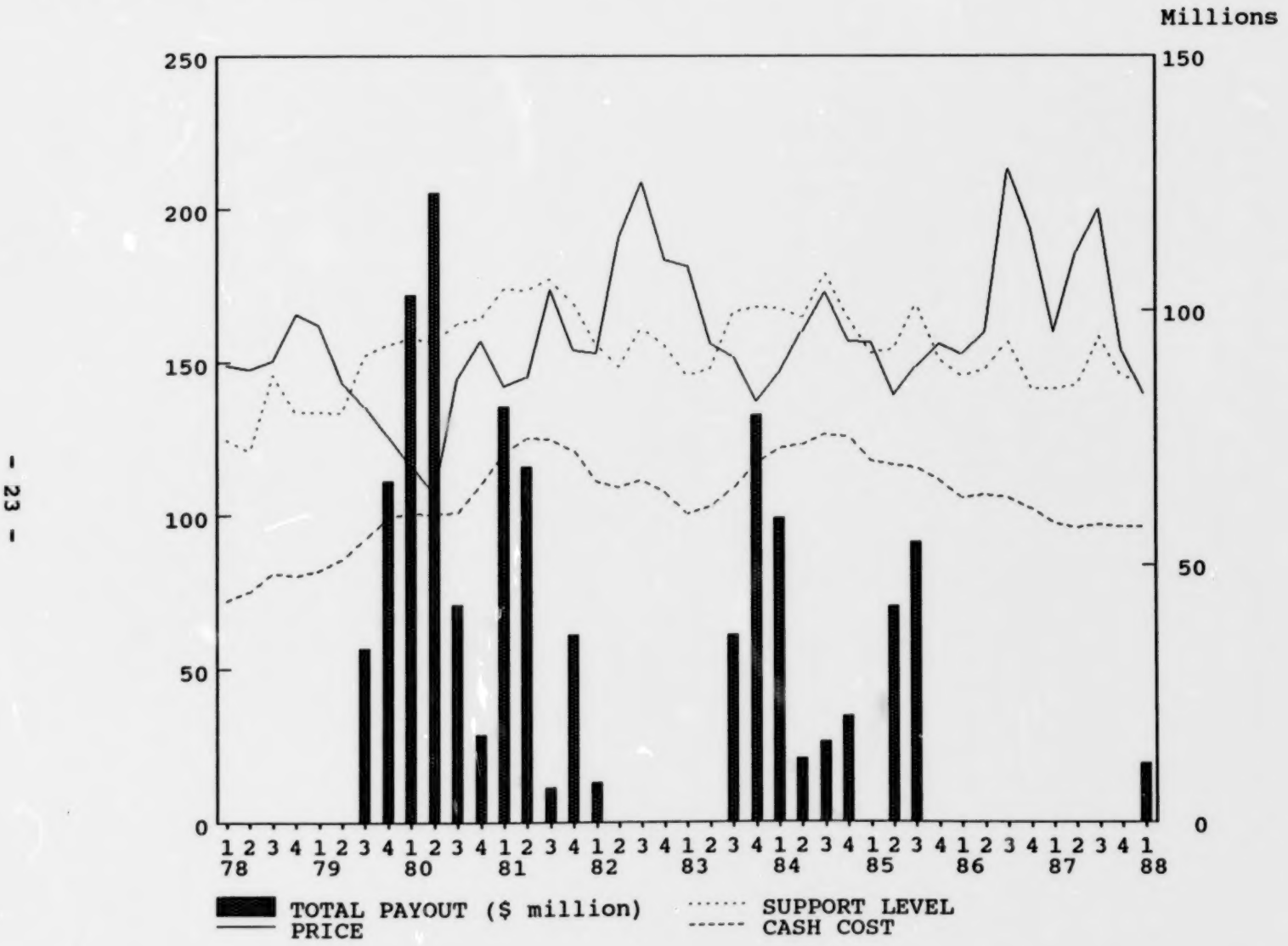
5-year-average cost = sum[cost(83q1+84q1+85q1+86q1+87q1)]/5

Support Level = National Cost + 0.93* [5-average-price less 5-average-cost]

Payout per CKG = Support Level less National Price if positive

Payout per head = Payout per 100 kilograms/2.2046 * the average dress weight.

Figutre 1. NTSP FOR HOGS
PAYMENT CALCULATIONS



VII. CONCLUDING REMARKS

The primary use of the hog model is to generate stabilization calculations for the Red Meats National Tripartite Stabilization Program for hogs. To this end, the model which has been recently revised, is meeting the objectives. With the development of new technology and changing production practices, it is important that the model incorporate such developments. The model has to be updated and revised on a continual basis to reflect new industry practices. The performance of the model needs to be closely monitored to ensure the objectives of the National Tripartite Stabilization Program are met.

APPENDIX I HOG COST MODEL - QUARTERLY INPUT TIME SERIES

Series	Source	Unit	Region/Location
Index 100 Price for pork	Weekly Marketing Board Prices Canadian Livestock and Meat Trade Report, Agriculture Canada	$/kg	- Edmonton - Saskatoon - Winnipeg - Toronto
Hogs Slaughter Index 80 and above by Province of grading	Canadian Livestock and Meat Trade Report, Agriculture Canada	Number	- British Columbia - Alberta - Saskatchewan - Manitoba - Ontario - Quebec - Atlantic
Barley Price (Prairies) Weighted Average Farm Price	1964 - 1976 Farm Price Survey, Statistics Canada; 1976 to present Non-Board Feed Grains, Grain Statistics Weekly, Canadian Grain Commission.	$/Tonne	- Alberta - Saskatchewan - Manitoba
Wheat Price (Prairies) Weighted Average Farm Price	1964 - 1976 Farm Price Survey, Statistics Canada; 1976 to present, Non-Board Feed Grains, Grain Statistics Weekly, Canadian Grain Commission.	$/Tonne	- Alberta - Saskatchewan - Manitoba
Corn Price Average Farm Price	Ontario Monthly Crop & Livestock Report, OMAF.	$/Bu	- Ontario
Barley Price Wholesale Selling Price	Grain Facts, Canadian Livestock Feed Board.	$/Tonne	- Vancouver - Quebec City - Montreal - Moncton

APPENDIX I

HOG COST MODEL - QUARTERLY INPUT TIME SERIES

Series	Source	Unit	Region/Location
Wheat Price Wholesale Selling Price	Grain Facts, Canadian Livestock Feed Board	$/Tonne	- Vancouver - Moncton
Corn Price Wholesale Selling Price	Grain Facts, Canadian Livestock Feed Board	$/Tonne	- Montreal - Quebec City
Hog Supplement Price Wholesale Selling Price	35 - 40 percent protein and FOB Mill door; Grain Facts, Canadian Livestock Feed Board	$/Tonne	- Alberta - Saskatchewan - Manitoba - Ontario - Quebec - Maritimes
Feed Conversion Ratio	Federal-provincial Record of Performance (R.O.P) for swine Annual Report, Agriuclture Canada	Number	- Canada
Building & Fencing	Farm Input Price Index, Statistics Canada	Index	- West - East
Machinery & Motor Vehicle	Farm Input Price Index, Statistics Canada.	Index	- West - East
Supplies & Services	Farm Input Price Index, Statistics Canada.	Index	- West - East
Hired Farm Labour	Farm Input Price Index, Statistics Canada.	Index	- West - East

APPENDIX I

HOG COST MODEL - QUARTERLY INPUT TIME SERIES

Series	Source	Unit	Region/Location
Property Taxes	Farm Input Price Index, Statistics Canada.	Index	- West - East
Prime Interest Rate	Bank of Canada Review	Percent	- Canada
Average Dress Weight of Inspected Hogs	Canadian Livestock and Meat Trade Report, Agriculture Canada.	Index	- Canada

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